



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification<sup>4</sup> :</b> <b>D21B 1/16, D21C 3/26</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 87/ 03022</b> <b>(43) International Publication Date:</b> 21 May 1987 (21.05.87)
<b>(21) International Application Number:</b> PCT/SE86/00454 <b>(22) International Filing Date:</b> 7 October 1986 (07.10.86) <b>(31) Priority Application Number:</b> 8505229-8 <b>(32) Priority Date:</b> 6 November 1985 (06.11.85) <b>(33) Priority Country:</b> SE  <b>(71) Applicant (for all designated States except US):</b> SUNDS DEFIBRATOR AKTIEBOLAG [SE/SE]; S-851 94 Sundsvall (SE). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only) :</b> DANIELSSON, K., Ove [SE/SE]; Nybergsgatan 8, S-114 45 Stockholm (SE). FALK, Bo, G., S. [SE/SE]; Avstyckningsvägen 45, S-175 43 Järfälla (SE). JACKSON, Michael [GB/ CA]; 1045 Marigold Avenue, North Vancouver, Brit- ish Columbia V7R 2E1 (CA).		<b>(74) Agent:</b> ILLUM, Leif-Otto; Svenska Cellulosa Aktiebo- laget SCA, Kungsgatan 33, S-111 56 Stockholm (SE).  <b>(81) Designated States:</b> AT (European patent), AU, DE (Eu- ropean patent), FI, FR (European patent), GB (Euro- pean patent), JP, NO, SE (European patent), US.  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> METHOD OF MAKING MECHANICAL PULP  <b>(57) Abstract</b>  Mechanical pulp intended for coated light weight paper (LWC), magazine paper or the like made as follows. Im- pregnation and preheating of the material, refining in a double-disc refiner, bleaching, refining in a single-disc refiner and screening of the pulp.		

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### Method of making mechanical pulp

This invention relates to the making of mechanical pulp from lignocellulose-containing material, intended for coated paper with low grammage, so-called LWC-paper (light weight coated), magazine paper or similar paper qualities.

For this type of paper the properties of the pulp have to meet very high requirements, because the paper must have high density, low roughness, low porosity and high strength. A uniform surface structure of these papers is of special importance.

Paper of this type normally includes both chemical and mechanical pulp. The traditional mechanical pulp component has been groundwood pulp. As an alternative thereto, thermo-mechanical pulp (TMP) has been used in recent years, but with limited success. Several examples have proved that the employment of TMP as mechanical pulp component, even at low freeness values, has resulted in unevennesses in the surface structure of the paper. This in its turn has given rise to poor coating and thereby unacceptable printability. These problems could be avoided only in those cases when the paper manufacturer had taken special steps for modifying or eliminating the negative effects of the long fibre fraction in the thermomechanical pulp. This long fibre fraction, namely, includes some long, rigid and unworked fibres, which have a negative effect on the paper surface structure.

Since recently, chemically modified TMP (CTMP) has constituted an attractive alternative to TMP as mechanical pulp component in LWC-paper and similar qualities. CTMP improves the strength and binding properties and, besides, implies that the problems with long fibre fractions can be reduced. This is due to the fact, that the mild chemical pretreatment substantially improves the defibering capability of the wood material and the swelling tendency of the fibres in the long fibre

fraction of the pulp. These changes bring about a lower shives content and an improved flexibility and ductility of the long fibres in CTMP compared to TMP.

TMP and CTMP for use in LWC-paper and the like usually are manufactured by refining in one or several steps and subsequent screening and bleaching. The energy consumption is relatively high, and a considerable equipment for dewatering and washing is required.

The present invention renders it possible that the equipment can be simplified and the energy consumption be reduced at the same time as the pulp quality is maintained or even improved.

The present invention implies in principle, that the refining is carried out in two steps with intermediate bleaching step. After impregnation and preheating of the raw material in the form of wood chips a refining is carried out in a double-disc refiner, i.e. a refiner with two counter-rotating refining discs. Thereafter a bleaching of the pulp at high concentration is carried out. After the bleaching a second refining at high concentration is carried out in a disc-refiner of single-disc type, i.e. with one stationary and one rotating disc. First thereafter the pulp is subjected to screening. The invention implies that the development of the light-scattering coefficient can be maximized in the first refining step. It is generally known that a double-disc refiner yields a higher light-scattering coefficient than a single-disc refiner. Due to the arrangement of the bleaching step, the pulp is easy-dewatered, so that the high pulp concentration required for the bleaching can be obtained with a simple dewatering equipment. The energy consumption, further, can be reduced in that the refining of the second step is carried out on pulp already bleached. The shives content of the pulp can be minimized by using single-disc refiners for the final refining.

The invention is described in the following with reference to an embodiment thereof.

The raw material in the form of wood chips is pretreated by washing, chemical impregnation and preheating in a conventional manner. As impregnation chemicals preferably  $\text{Na}_2\text{SO}_3$  or  $\text{Na}_2\text{SO}_3 + \text{NaHSO}_3$  with pH-range 6-12 are used. The temperature of the material is increased by the pre-heating to 105-145°C.

The material pretreated in this way is subjected to refining under pressure in a double-disc refiner. The refining in this first step yields a pulp with a freeness value according to CSF of 150-300. The pulp, thus, is relatively easy-dewatered. The pulp, therefore, can be pumped to the bleaching step where it is dewatered to desired concentration, 30-45%. The equipment for dewatering thereby can be simple and, thus, imply low investment costs. Thereafter the chemicals required for the bleaching are added. The bleaching preferably is carried out with peroxide or dithionite to an ISO-brightness > 70.

After the bleaching the pulp is washed and thereafter subjected to the second refining, which is carried out at high concentration, 25-45%, and driven to a freeness value according to CSF of 50-150.

Due to the refining being carried out after the bleaching, the energy consumption for the refining is reduced. The bleaching, thus, has rendered the pulp easier to be processed to desired quality. The second refining preferably is carried out at overpressure in a single-disc refiner equipped with a device for accurate gap adjustment and gap control, whereby it is possible to minimize the shives content of the pulp and simultaneously, within certain limits, to control the shortening of the fibre length to the desired mean fibre length of the pulp at desired energy consumption.

After the second refining step, the pulp is screened and cleaned according to conventional methods before the pulp

is ready for its transfer to a paper mill for the making of LWC-paper or similar paper qualities.

The invention, of course, is not restricted to the embodiment described above, but can be varied within the scope of the invention idea.

Claims

1. A method of making mechanical pulp from lignocellulose-containing material, intended for coated light weight paper (LWC), magazine paper or the like, characterized by a combination of the steps
  - a) impregnation and preheating of the material,
  - b) a first refining under pressure in a disc-refiner with two counter-rotating beating discs (double-disc refiner),
  - c) admixture of bleaching chemicals and bleaching at high concentration,
  - d) a second refining under pressure in a disc-refiner with one stationary and one rotating disc (single-disc refiner),
  - e) screening of the pulp.
2. A method as defined in claim 1, characterized in that the first refining is carried out to a freeness value according to CSF of 150-300, and the second refining to 50-150.
3. A method as defined in claim 1 or 2, characterized in that the bleaching is carried out with peroxide or dithionite to an ISO-brightness above 70.

# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE86/00454

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC 4 <div style="text-align: center; font-family: monospace;">D 21 B 1/16, D 21 C 3/26</div>														
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; font-size: small;">Minimum Documentation Searched 7</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; text-align: left; font-size: x-small;">Classification System</th> <th style="text-align: left; font-size: x-small;">Classification Symbols</th> </tr> <tr> <td style="vertical-align: top;">IPC 4 US C1</td> <td style="vertical-align: top;">D 21 B 1/02, /12, /14, /16, /30; D 21 C 3/00, /26 <u>162</u>:19, 23, 24, 25, 26, 28, 71, 78</td> </tr> </table> <div style="text-align: center; font-size: x-small; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched *</div> <div style="padding: 5px; font-family: monospace;">SE, NO, DK, FI classes as above</div>			Classification System	Classification Symbols	IPC 4 US C1	D 21 B 1/02, /12, /14, /16, /30; D 21 C 3/00, /26 <u>162</u> :19, 23, 24, 25, 26, 28, 71, 78								
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<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT *</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; font-size: x-small;">Category *</th> <th style="font-size: x-small;">Citation of Document, 11 with indication, where appropriate, of the relevant passages 12</th> <th style="width: 10%; font-size: x-small;">Relevant to Claim No. 13</th> </tr> <tr> <td style="vertical-align: top; text-align: center;">X</td> <td style="vertical-align: top;">           US, A, 4 294 653 (J.A. I. LINDAHL, L.G. RUDSTRÖM)            13 October 1981            &amp; SE, 413684            FR, 2285489            DE, 2540919            AU, 84629/75            GB, 1519848            JP, 51060702            CA, 1070907            SE, 7411949  <div style="margin-left: 100px; font-style: italic;">= Case 1270 "Deroxid-blekning II"</div> </td> <td style="vertical-align: top; text-align: center;">1</td> </tr> <tr> <td style="vertical-align: top; text-align: center;">X</td> <td style="vertical-align: top;">           EP, A1, 30 778 (THE ONTARIO PAPER COMP LIM)            24 June 1981            &amp; JP, 56091093            AU, 60460/80            CA, 1145107            AU, 531907         </td> <td style="vertical-align: top; text-align: center;">1, 2</td> </tr> <tr> <td style="vertical-align: top; text-align: center;">A</td> <td style="vertical-align: top;">           US, A, 3 467 574 (W.B. WEST)            16 September 1969            &amp; SE, 344774  <div style="text-align: right; margin-top: 10px;">.../...</div> </td> <td></td> </tr> </table>			Category *	Citation of Document, 11 with indication, where appropriate, of the relevant passages 12	Relevant to Claim No. 13	X	US, A, 4 294 653 (J.A. I. LINDAHL, L.G. RUDSTRÖM) 13 October 1981 & SE, 413684 FR, 2285489 DE, 2540919 AU, 84629/75 GB, 1519848 JP, 51060702 CA, 1070907 SE, 7411949 <div style="margin-left: 100px; font-style: italic;">= Case 1270 "Deroxid-blekning II"</div>	1	X	EP, A1, 30 778 (THE ONTARIO PAPER COMP LIM) 24 June 1981 & JP, 56091093 AU, 60460/80 CA, 1145107 AU, 531907	1, 2	A	US, A, 3 467 574 (W.B. WEST) 16 September 1969 & SE, 344774 <div style="text-align: right; margin-top: 10px;">.../...</div>	
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<div style="font-size: x-small;">           * Special categories of cited documents: 10            "A" document defining the general state of the art which is not considered to be of particular relevance            "E" earlier document but published on or after the international filing date            "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)            "O" document referring to an oral disclosure, use, exhibition or other means            "P" document published prior to the international filing date but later than the priority date claimed            "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention            "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step            "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.            "A" document member of the same patent family         </div>														
<b>IV. CERTIFICATION</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;">           Date of the Actual Completion of the International Search  <div style="text-align: center; font-family: monospace;">1986-12-19</div> </td> <td style="width: 50%; vertical-align: top;">           Date of Mailing of this International Search Report  <div style="text-align: center; font-family: monospace;">1987-01-08</div> </td> </tr> <tr> <td style="vertical-align: top;">           International Searching Authority  <div style="text-align: center; font-family: monospace;">Swedish Patent Office</div> </td> <td style="vertical-align: top;">           Signature of Authorized Officer  <div style="text-align: center;">              Marianne Bratsberg           </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center; font-family: monospace;">1986-12-19</div>	Date of Mailing of this International Search Report <div style="text-align: center; font-family: monospace;">1987-01-08</div>	International Searching Authority <div style="text-align: center; font-family: monospace;">Swedish Patent Office</div>	Signature of Authorized Officer <div style="text-align: center;">              Marianne Bratsberg           </div>								
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 3 016 324 (C.K. TEXTOR) 9 January 1962 See spec. column 2, lines 29-48.	
A	US, A, 3 388 037 (A.J.A. ASPLUND ET AL) 11 June 1968 & SE, 303088	



# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE87/00124

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC		
D 21 B 1/02, D 21 C 9/00		4
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched †		
Classification System	Classification Symbols	
IPC 4 US C1	D 21 B 1/02, /16; D 21 C 9/00 162:23, 24, 25, 26, 27, 28	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
SE, NO, DK, FI classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT*</b>		
Category *	Citation of Document, †† with indication, where appropriate, of the relevant passages ‡	Relevant to Claim No. ‡
X	EP, A, 0 096 548 (MACMILLAN BLOEDEL LIMITED) 21 December 1983 & JP, 59015589 CA, 1177608 US, 4502918	1-3
Y	SE, B, 422 088 (MO OCH DOMSJÖ AB) 15 February 1982 & FR, 2442296 DE, 2946376 JP, 55071892 CA, 1110480 US, 4324612 AU, 521567	1
Y	US, A, 4 270 976 (DEFIBRATOR AB) 2 June 1981 & FR, 2371544 DE, 2752081 JP, 53065401 GB, 1590704 CA, 1112816 SE, 7613088 SE, 7703137	5
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: ††</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search 1987-06-04		Date of Mailing of this International Search Report 1987-06-11
International Searching Authority Swedish Patent Office		Signature of Authorized Officer  Marianne Bratsberg

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	Pulp and Paper International, vol 22, December 1980 p. 54-56, Gavelin "A single TMP Furnish-The Monopulp Process".	1-6
Y	Canadian pulp and Paper Association Preprints 68 B, January 1982, A-C Shaw, The Opco Process applied to TMP Screened Rejects.	1